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Policies for Drone-Based Post-Disaster Assessment

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Abstract

The use of drones in post-disaster scenarios is crucial for rapidly identifying damaged areas. However, since a drone cannot visit all grids within a single routing cycle, predictive methods are employed to estimate the damage status of unvisited grids. In this study, three different damage prediction policies are proposed and analyzed, prioritizing grids with a higher probability of being damaged. TP1 policy considers all unvisited grids in a cluster as damaged if the cluster's targeted coverage and observed damage rate exceed predefined thresholds, increasing their priority. TP2 policy enhances TP1 policy by introducing a cumulative damage ratio for each grid, aiming to refine the accuracy of predictions. TP3 policy evaluates the spatial distribution of grids by comparing intra-cluster and inter-cluster distances to assess the reliability of predictions. These prediction policies are developed based on the targeted coverage ratio and observed damage rate. Their performance is evaluated based on the time of the visits and whether the grid is damaged. Experimental tests with varying threshold values and coverage ratios indicate that the TP1 and TP2 policies perform similarly, while the TP3 policy yields less accurate predictions. Additionally, the TP2 policy requires more memory and computational resources, leading to the selection of TP1 policy as the most suitable prediction policy for the problem. This study was supported by the Scientific and Technological Research Council of Türkiye (TUBITAK) under the Grant Number 121M857. The authors thank TUBITAK for their support.

Keywords
Drone Routing, Post-disaster, Prediction.